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ABSTRACT

Streaming video used as an augmentation in Web-based instruction was investigated to: (1) determine if demographic characteristics would lead to significantly different beliefs about the use and perceived effectiveness of streaming video, and (2) whether or not there are characteristics of streaming video that would lead to beliefs about the effectiveness of streaming video that would lead to beliefs about the effectiveness of streaming video when used as an augmentation to a text and still image-based Web-based tutorial. College students (n=69) received a Web-based database tutorial that was either text with still images only or one augmented with streaming video clips. All participants took an online pretest/posttest, and participants viewing the streaming video also took an online survey to gauge beliefs. Five participants were interviewed to explore their beliefs and attitudes further. Demographic characteristics measured were gender, age range, academic college, undergraduate/graduate status, Internet access location (home or campus computer lab), and prior experience with the World Wide Web. Age range, academic college, undergraduate/graduate status, and Internet access location results in significant chi-square differences on certain beliefs about streaming video relating to learning and attention holding. Significant correlations were found between age range, undergraduate/graduate status, Web experience level, and beliefs about learning, attention holding, and problems with streaming video in a Web-based instructional environment. Phenomenological analysis of the interviews revealed a number of themes. The first was that subjects felt that streaming video clips acted as a learning reinforcement. Subjects also believed that the clips helped hold their attention and fit their learning styles. The streaming video helped create a feeling of the presence of the instructor. The size and appearance of the clips did not seem to affect beliefs or attitudes toward the clips. An appendix contains the study survey. (Contains 5 tables and 46 references.) (SLD)

Running head: AN ASSESSMENT OF STREAMING VIDEO

An Assessment of Streaming Video In Web-based Instruction

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Abstract

Streaming video used as an augmentation in Web-based instruction was investigated to: (a) determine if demographic characteristics would lead to significantly different beliefs about the use and perceived effectiveness of streaming video, and (b) whether or not there are characteristics of streaming video that would lead to beliefs about the effectiveness of streaming video when used as an augmentation to a text and still image-based Web-based tutorial. 69 college students received a Web-based database tutorial that was either text with still images only, or one augmented with streaming video clips. All participants took an online pre-test/ post-test, and participants viewing the streaming video clips also took an online survey to gauge beliefs. Five participants were interviewed to further explore their beliefs and attitudes towards streaming video and Web-based instruction. Demographic characteristics measured were gender, age range, academic college, undergraduate/graduate status, Internet access location used for the study, either home or campus computer lab, and prior experience level with the World Wide Web. Age range, academic college, undergraduate/graduate status, and Internet access location resulted in significant Chi-Square differences on certain beliefs about streaming video relating to learning and attention holding. Significant correlations were found between age range, undergraduate/graduate status, Web experience level, and beliefs about learning, attention holding, and problems with streaming video in a Web-based instructional environment. Phenomenological analysis of the interviews revealed a number of themes. The first was that subjects felt the streaming video clips acted as a learning reinforcement. Related to the theme of reinforcement, the subjects believed the clips helped hold their attention and fit their learning style. Additionally, the streaming video clips created a feeling of the presence of the instructor.

The size and appearance of the streaming video clips did not seem to affect beliefs or attitudes towards the clips.

An Assessment of Streaming Video In Web-based Instruction

Streaming video is a fairly new technology available for Web-based instruction, so most Web-based instruction has been composed of textual content, still or simple animated images, and some form of class communication (Belanger & Jordan, 2000). Streaming video now seems to be growing in popularity and a number of institutions are experimenting with its application. However, there is a paucity of literature on streaming video and its effectiveness in Web-based instruction.

Streaming video can be operationally defined as video that is transmitted in a continuous data stream over the Internet to an appropriate Web browser playback program for immediate display. Previously, video files delivered over the Internet had to finish downloading before they could be viewed, which took a long time due to the very large size of standard video files. Streaming video allows a user to begin watching a video file almost as soon as the video data arrives at the Web browser (Waggoner, 2000).

Placing streaming video on the Web is now fairly easy and inexpensive. The manufacturers of streaming video products have made great strides in quality and utility. Although streaming video may not immediately approach TV-quality over an analog dial-up connection, many distance education programs and educational institutions will attempt to incorporate streaming video into their arsenal of Web tools. Many projects have already examined the effectiveness of Web-based instruction (Jung & Rha, 2000). Therefore, research into the effectiveness of streaming video in Web-based instruction needs to occur now, rather than later.

The purpose of this study was to investigate the use of streaming video in Web-based instruction as an augmentation to text and image based Web-based instruction in a higher

education class. Specifically, this study looked at beliefs about the use and perceived effectiveness of streaming video in a Web-based learning environment and the demographics gender, age, academic college, location of Internet access, either home or campus computer lab, and prior experience with the Web as measures of the effectiveness of streaming video. A parallel study (Cofield, 2001) examined achievement scores as a measure of the effectiveness of streaming video in a Web-based learning environment.

The research questions posed by this study were whether or not demographic characteristics lead to significantly different beliefs about the use and perceived effectiveness of streaming video in Web-based instruction and whether or not there are characteristics of streaming video in a Web-based instructional environment that lead to beliefs about the effectiveness of streaming video in a Web-based instructional environment?

Assumptions associated with this research project are that all students who participated had access to the Web and to the tools required to access the study material. Another assumption is that the participants were representative of students at the University of Montevallo, and that they were representative of the student population with access to Web-based instructional tools at the postsecondary level. One limitation is that the study only included students from a single institution in the southeastern region of the United States. Another limitation is that the location and type of computer used by each subject to participate in this study was uncontrolled. This potentially biased beliefs about the effectiveness of streaming video due to the possibility of different computers displaying the content of the study differently from what the researcher intended. Data transmission over the Internet, which is out of the control of the researcher due to the existing design and infrastructure of the Internet itself, may have introduced unintended biases.

Review of the Literature

Streaming video is transmitted over a data network. The term implies a one-way transmission to the viewer. With non-streaming video, a significant portion of the video file must be successfully downloaded over the Internet before a video clip can begin playing. Streaming video allows for live video transmission over the Internet, and it allows the server to dynamically adjust the video data transmission rate depending on the user's current connection status, whether that connection is a high-speed T-1 line or a 56K dial-up modem (Dixon, 2000).

The ability to play video over the Internet is recent. In the days before the widespread use of high-speed modems, video files would take a very long time to download, and the files had to completely download before playback would be possible. The compression technology was primitive and video quality was extremely poor. Video played from CD-ROM drives was often jerky, low quality, and usually described as "postage-stamp" video due to its small size (Rule, 1999). Computer and video compression technology have advanced to the point where it is now possible to play video over Internet connections in real time and with much higher quality, due to the human visual system's ability to still make sense of a video sequence that has been compressed enough to either be downloaded or streamed over the Internet (Strachan, 1996). Although streaming video is far short of broadcast television standards, it is now considered an acceptable delivery medium for a wide variety of uses (Pescatore, 2000).

Streaming Video Research

A considerable body of literature exists on the subject of current and potential uses of streaming video, but only one study was found that actually incorporates streaming video in a research design. Hecht & Klass (1999) examined whether or not streaming audio and video technology could be used for primary instruction in off-campus research classes. The study was

conducted using two graduate level research classes in the College of Education at Illinois State University beginning in the summer of 1998. Various methods of distance education including compressed video over dedicated lines and over the Internet were considered before the authors settled on a streaming video solution.

A master's level qualitative research in education course delivered simultaneously to both an on-campus and an off-campus cohort comprised the first trial. Both cohorts consisted of 20 graduate students. The off-campus cohort consisted of 20 students enrolled in a doctoral program administered by Illinois State University to educators in Thailand. Using Real Media's streaming technology, the qualitative research class was offered to the off-campus cohort in both synchronous and asynchronous modes. The on-campus cohort attended the class at the regularly scheduled time with the instructor. A number of important observations can be gleaned from the student comments about the course. One on-campus student stated, "It felt, at times, like [the instructor] was teaching two different classes at once." This was explained as being a function of the real-time chat provided for off-campus students participating synchronously in the course. The interactive chat system allowed off-campus students to communicate among themselves, and to question the instructor. However, it did not permit instantaneous interaction so slow response times made it seem to the off-campus students that by the time the instructor would receive a question, the instructor would already be well into another topic. A few of the off-campus students did not like the delivery of this course by streaming video at all, preferring instead an asynchronous course without taped or live streaming lectures, a function of the flexibility of the delivery method. The instructor reported having to spend large amounts of time to tailor the course to what amounted to three different modes of delivery: live and in-person, live and at a distance, and asynchronous. No results on student achievement or learning were reported.

The second trial in the study used a doctoral-level research design and statistics class broken down into two sections: a section for 25 students from the university's Thailand doctoral program, and a section of 14 doctoral students from an off-campus site three hours from Illinois State University. The Thailand cohort would participate in the course using the same streaming video technology from the first trial. A number of students had problems with Internet congestion, and others, with the minimal hardware configuration recommended by Real Media, experienced losses of video or audio while attempting to participate in class. The instructor reported that because of the time required for the creation and maintenance of the class, the tendency was to rely heavily on the streaming lecture alone rather than on activities and content geared to on-line delivery. A difference in attitude between the Thai cohort and the non-overseas cohort was observed. The Thai cohort felt that the Internet extended opportunities for more interaction within the course. The non-overseas cohort felt that the streaming video delivery was a major imposition (Hecht & Klass, 1999).

Streaming Video Practices in Education

Stanford University's Stanford Online distance learning program uses streaming video to deliver lectures and other course materials to the students' home or work computers. Classes in the Stanford Online program consist of streaming video, Web pages with static images and text, and other material provided by the instructor, all displayed inside an Internet browser window (DiPaolo 1999). Stanford Online grew from a research project assessing asynchronous distance education at Stanford University. The project initially utilized QuickTime movies to deliver lectures, but the long download times for the non-streaming video files proved to be a barrier to students. Stanford Online switched to streaming video during the 1996-1997 academic year when the program's administrators felt the technology had become a viable option for course

delivery. Students who utilize the Stanford Online courses report the videos contribute positively to the overall learning experience (Schultz & Rouan, 1998).

Streaming video lectures are offered on a variety of subjects by the Cornell University Office of Distance Learning as part of the Weill Medical College of Cornell University Grand Rounds Project (n.d.). Each streaming video lecture includes a slide show that is timed to the video of the instructor. Microsoft Windows Media Player is used for streaming the video, and each clip is available at different transmission rates for connections ranging from 28.8 dial up modems to high-speed T-1 connections. Streaming video was chosen for this project due to a belief that students would get more out of the Internet delivery than by actually attending the lecture (Johnson, 1998)

Research on the Effectiveness of Web-Based Instruction

Streaming video is an Internet-based content delivery method. Thus, for instructional purposes, streaming video must necessarily be used in a Web-based instruction system (WBIS). Liegle and Meso (2000) note that a WBIS allows for the delivery of knowledge to a well-defined set of learners via the World Wide Web by enabling both instructors and learners to fulfill all of the roles found in a conventional learning environment.

A 1997 study by Edwards and Fritz suggests that students are demanding and willing to pay for education and learning experiences that can be delivered at the time and place where that learning is most relevant and convenient. Three different class formats were examined to assess students' perceptions of outcomes of various educational media formats. Each one used Web-based instruction in a different context, from online lecture materials to supplementary course material. The study revealed that Web-based learning was perceived to be enjoyable, interesting, and helpful for learning concepts and applications. From the sample studied, the effectiveness of

Web-based instruction appeared to have been influenced by student access to material. Correlations between access and perceptions of independent learning and mastery were strong, although not always significant.

Research on the Effectiveness of Video in Non-Streaming Video Applications

A number of researchers have looked at the effectiveness of video in education over the past 50 years. Studies have examined a variety of video delivery methods, as well as the overall effectiveness of video for learning. Applications of video have included broadcast television, satellite delivery, videotapes, and compressed video over dedicated connection lines, known as videoconferencing. The use of the term video in this context differs from streaming video mainly in the context of the newness of streaming video technology. Since both streaming video and other video delivery methods have moving images in common, however, other research studies on the effectiveness of video in non-streaming video applications bear examination.

Brown (1975), in a study of learner responses to the use of television, surveyed students in four University of Mid-America educational television courses to determine attitudes towards and the effectiveness of instructional television. The determination was made that while many courses focus mainly on direct impartation of content knowledge, a more effective use of television was to focus on affective elements of learning, such as course enjoyment and maintenance of learner interest. The survey by Brown was designed to test the effectiveness of television courses designed with an affective orientation. Brown concluded that enrollees in courses exhibited a low tolerance for any television component material not perceived to be directly instructional, such as techniques perceived to be strictly for the learner's entertainment. Brown also noted that the content of the television programs should be integral with the content of the other components of the course, and the television component itself should provide

significant learning, without simply being a reiteration of material presented elsewhere in the course.

Boverie, Murrell, Lowe, Zittle, Zittle, and Gunawardena (1997) analyzed the interaction between the learner and the instructor in two interactive satellite television distance learning programs designed for primary schools in a study that examined three research questions: (1) the importance of providing live broadcasts rather than taped instruction, (2) the importance of providing social presence in producing learner satisfaction, and (3) the importance of providing interaction between the learners and the on-screen instructor. Each program was delivered by one-way video, two-way audio satellite broadcast, with interaction taking place during the broadcast by telephone, e-mail, and fax. Data were collected by mail surveys and case studies. Boverie et al. reported no significant difference in student satisfaction when watching the language program either live or taped, although a significant difference was found with students indicating more satisfaction with the videotaped science program than with the live broadcast. For teachers, no significant difference was found in satisfaction levels between viewing the program live or taped. Analysis of the data revealed a moderate to high relationship between the social presence of the television instructor, defined as the teacher's humanizing qualities and instructional style, and overall student satisfaction in both programs. No significant difference was found in an analysis of the importance of providing interaction between learners and the on-screen instructor in student satisfaction for either program during broadcast times or outside of broadcast times. Teachers were more satisfied with the science program if their classes could call in and talk to the television teacher outside of broadcast times, indicated by an overall significant difference in teacher satisfaction. Boverie et al. concluded that satisfaction with the program

could be predicted by social presence and interaction, and that the results indicated that watching the programs live had the same effect as watching them on tape.

Mahendran and Young (1998) evaluated the use of advanced technology videotapes, defined as an integration of computer and laboratory simulations of advanced engineering concepts, at the Queensland University of Technology to improve the quality of lectures and to replace certain laboratory teaching. One phase of the evaluation looked at the learning process. Six second-year undergraduates were shown a videotape and were asked a series of questions regarding attitudes towards the videotape and questions on the use of data visualizations and section design. The results demonstrated that the videotape was a worthwhile learning resource for use in the lecture, and in particular, that the computer simulations were seen as very important and useful by the students in gaining an understanding of the subject matter. Mahendran and Young concluded that the videotapes would produce a range of significant benefits, such as replacing the laboratory teaching in the videotape subjects.

In a qualitative study of the use of video in the classroom in two Indiana school districts, Wise and Groom (1996) found that grades and grading did not change with the implementation of a multimedia system that delivered video and computer-enriched information to the classroom. Teachers did observe, however, that the use of various forms of video programs held the interest of most students better than instructor lecture alone. Students uniformly commented that classes conducted with video assisted instruction were more interesting and made the subject matter easier to learn. Wise and Groom conclude that concentrating on grades as a measure of the effectiveness of learning may not be the best route, but that in-depth understanding, the ability to generalize, and a desire to continue learning as an enjoyable experience are positive effects of multimedia use in the classroom that can be built upon.

The assessment of Cyberbuch, a Macintosh computer-based multimedia program designed to improve the comprehension skills of students who are beginning to read German texts, by Chun and Plass (1994) entailed three separate areas: usability, learner behavior, and effects on language learning. The results of the usability test reveal pictures and movies were ranked by students as the most helpful, with text links of actual definitions rated the least helpful. The Cyberbuch user logs were examined next for correlations between which types of links were actually chosen and which were reported by students to be most helpful. A negative correlation was found when a text link was chosen, with users not finding the text link helpful more than 50% of the time. On the other hand, when either pictures or QuickTime video clips were chosen, users did find those links helpful in 57% and 74% of the cases, respectively. The last assessment of the Cyberbuch program revealed a positive correlation between the type of link chosen during a vocabulary quiz and whether the word was learned correctly. Chun and Plass conclude that while the QuickTime clips were of much lower quality compared to the physical clarity of textual and picture links, the video clips were found to be most useful overall, which suggested that the most important factor appeared to be the type rather than the quality of the link.

Factors that Impact the Usability of Streaming Video

Usability is a term for being convenient and practicable for use (Merriam-Webster Online, 2000). Like any tool, streaming video must be usable before it can be effective. Streaming video is compressed video, which potentially impacts the usability of the video. Audio quality of the streaming video must also be considered to determine the usability of the material.

Streaming video, due to the technical requirements of transmission over limited bandwidth, normally implies a loss of resolution or image size from the original video source. D. J. Dwyer (1985) studied the effect of television screen size and resolution on the legibility of

graphics. Using three CRT screen sizes and four levels of resolution, D. J. Dwyer assessed the impact of changes in these variables on PC board chip locator performance. The results showed that screen size had a significant effect on response accuracy only when discriminability between test points was low. Response time, measured as the time it took the subject to locate and identify a test point chosen by random computer selection, and response accuracy were not significantly different at different screen sizes or resolutions. D. J. Dwyer concluded that display size had no significant impact on the amount of time required to perform the locator task, and that level of resolution had no practical impact on either response accuracy or response time.

Streaming video is by its nature digitized and compressed video. Compressed digital video is analog video that has been digitized, or converted from an analog signal to a digital signal (Anderson, 1982), and then mathematically scaled down to reduce redundant information and improve transmission efficiency (Ohanian, 1998, chap. 10). Video that is compressed is materially different from the original video signal. However, due to the nature of human vision, much of the information contained in a video signal can be discarded, and still result in a recognizable picture, which is how digital video compression works. Compression technology allows a full-size, full-frame video signal that requires nearly 170 megabits per second (Strachan, 1996), well beyond the capability of most computers and networks to process, to be scaled down to produce a recognizable picture capable of being delivered over the Internet through a 28.8 Kbps modem (Real Video, n.d.). This is an almost 6000-to-one reduction. At such extreme compression ratios, a logical question would be to ask what is the least amount of information transmitted for a video image to be recognizable. Ohanion (1998, chap. 3) noted that in the 1970s Bell Laboratories in New Jersey sought to ascertain how much information would have to be sent over a standard phone line for a picture phone image to be recognizable. The researchers

came to the conclusion that if the intent of the image could be preserved the tendency of the human eye to blend contiguous areas and infer meaning would produce a recognizable image.

Audio, which includes dialogue and music, is as important as visual imagery in evaluating streaming video technologies (Waggoner, 1998). The fidelity of the audio is the most critical component of media with regard to getting the message across (Reeves & Nass, as cited in King, Harnar, & Mayall, 1999). When streamed, the audio must also be compressed. Although the bandwidth and information requirements for audio are less than for video, the human ear is much more sensitive to distortions or errors in the audio signal than the human eye is to errors in the video signal (Anderson, 1982).

One such problem is asynchrony, or non-synchronization of audio and video. Verhagen (1994) pointed out that in audiovisual presentations, the visual channel and the audio channel are used simultaneously to convey messages. Hecht and Schoon (1999) noted in their evaluation of CU-SeeMe videoconferencing that non-synchronization of audio and video when using CU-SeeMe often resulted in a very confusing presentation for the students. The audio would sometimes lag seconds behind the video, stop, or even play ahead of the video signal. King, Harner, and Mayall (1999) state that synchrony in media equals real life, and that asynchrony is unnatural. King et al. examined the effect on students of audio and video asynchrony. Using a T-1-based compressed video conferencing system, subjects were asked if they perceived asynchronous audio/video to have an effect on their performance. The subjects' self-reported attitude toward the asynchronous audio/video connection showed that the subjects did not regard this problem as serious or distracting, and their perception of their course achievement was not affected by the asynchrony.

Method

The research design included an experimental aspect in which the effectiveness of streaming video as an augmentation in Web-based instruction was explored. Instruction in the basic use of Microsoft Access 2000 was the content matter. The dependent variable in this study was beliefs about streaming video. All instructional modules and assessments were delivered through the Web. Independent variables were the demographics gender, age, academic college, location of Internet access, either home or campus computer lab, and prior experience with the World Wide Web, and the presence or absence of streaming video in a Web-based instructional environment. The data were also used to determine whether implications related to beliefs and demographic characteristics exist in using streaming video in a Web-based learning environment for students in higher education.

Research Population and Sample

College students who are exposed to a Web-based instructional environment through the use of Web-based instructional modules were the target population for this study. The sample consisted of students enrolled in seven different courses offered during the Summer 1, 2001, academic term at the University of Montevallo, a public liberal arts southeastern United States university. This sample was used because of convenience. All interactions with the subjects were consistent with University of Alabama IRB and University of Montevallo HASRC policies and were approved by the IRB and HASRC.

Data Collection

Demographics were measured through the use of a Web-based survey, developed by the researcher and administered to all subjects as the first step in the study. Beliefs about streaming video were measured by a Likert-type questionnaire developed by the researcher and

administered to the group viewing the Web-based instruction augmented with streaming video. Although this instrument lacks proven validity, the researcher pursued acceptable face and content validity from directions suggested by the review of literature and input from the University of Alabama Computers and Applied Technology Program faculty. Beliefs suggested by Edwards and Fritz (1997), Chao (1999), and Miller et al. (1993) with regard to Web-based instruction included levels of enjoyment and interest, and perception of amount and quality of learning.

Qualitative Research

Four subjects, two from both the control and experimental groups, were chosen at random and asked to participate in a brief interview. The researcher developed questions used in the interview with input from the Computers and Applied Technology program faculty. The reason for conducting a qualitative component in this study is because there has been virtually no previous research on the topic, and there is no recognized theory relevant to the topic. As one of the first, if not the first, study about streaming video, this was an exploratory study. By collecting information about beliefs and interviewing random students, more was learned about the subject than merely a comparison of gain scores (Gall, Borg & Gall, 1996, p. 603). It was expected that the individual experiences of different subjects in the sample would lead to different beliefs and interpretation that may not be apparent in other data.

Procedure

Participants were directed to a Web site describing the opportunity to participate in the research project. The Web site contained an explanation of Web-based instruction, streaming video, and instructions on the use of the Web-based tutorial and on computer hardware and software requirements. Since the instrument was accessed via the Web, it was available to the

participants at their choice of time and computer location, either home, lab, or work. Students were randomly divided into control and experimental groups. Although this was a convenience sample, and not a true random sample, neither the researcher nor the course instructors controlled which course students enrolled in, which should have alleviated violations of random assignment for data analysis. The control group then received a Microsoft Access 2000 tutorial that consisted of text and still images while the experimental group received a tutorial identical in content, with the addition of brief streaming video clips matched to the respective text and still picture content and accessed by means of a plainly labeled hyperlink at the beginning of each tutorial section. Content for the Access 2000 tutorial came from a text and still image-based Access 2000 Web-based tutorial developed for use in BCT 100, Computers and Applied Technology, at the University of Alabama (Marsh, n.d.). Streaming video clip content mirrored the text and image content used in the tutorial. The researcher produced the streaming video clips which were accessed through hyperlinks and were composed of audio voice-overs, computer screen close-ups, and an on-screen host. Participants in the experimental group received a Web-based survey designed to gather information about their beliefs on the perceived effectiveness of streaming video in Web-based instruction. Two random participants from each group were interviewed to attempt to delve further into their beliefs about the effectiveness of streaming video in Web-based instruction.

Streaming Video Clip Production

All video clips were shot using a Sony VX-2000 mini-DV camcorder using a clip-on lavaliere microphone for high quality audio. Production took place in the University of Montevallo Division of Mass Communication television studio. The video host read the script from a teleprompter to ensure conformity with the scripted tutorial. Clips consisted of brief

close-up shots of the video host while the content matter of the particular clip was introduced, followed by close-up shots of the computer screen while the host narrated the clip's content. The host was visible on each clip less than 10% of the total time of each clip. This production method was selected as the most effective and efficient use of the medium elements, including video images, audio, and television production equipment (Zettl 2001, p. 10).

Streaming video clips were delivered over the Internet via Real Network's RealVideo software at a resolution of 160 pixels by 120 pixels, or one-quarter of the normal resolution of a television display, which is the minimum standard size supported by RealVideo. RealVideo software was chosen partly because of the software's availability, and partly because of its reputation as the leader in streaming video technology (RealNetworks Reports First Quarter Results, 2001).

Data Analysis

Demographics and results from the Web-based belief survey were reported using measures of central tendency and variation, frequencies, and percentages. Chi-Square tests were conducted to determine if any significant relationships existed between demographic characteristics and beliefs. Beliefs were also correlated with demographics to determine if relationships among the groups exist.

The specific methodology employed in the qualitative design was a phenomenological approach, because it seemed most appropriate for an exploratory study. The goal was to examine the general theory that streaming video augments static lessons. Phenomenology is an attempt to determine how participants derive meaning, or how the phenomena are disclosed (Gall, Borg & Gall, 1996, p. 600). Analysis of the interviews was based on data reduction and interpretation

aimed at identifying categories and themes (Heath, 1997). Every attempt was made to make certain that conclusions are credible, generalizable, and dependable.

Results

The research sample consisted of 103 University of Montevallo student volunteers who were enrolled in seven Summer 1, 2001, courses. The instrument was attempted by 77 of the students, and completed by 51, which is 50% of the total number of students enrolled in the courses. By chance, the distribution of the gender, age, academic college, and undergraduate/graduate status of the sample reflects that of the actual University of Montevallo demographic makeup (Fact Book 1999-2000, n.d.). A majority (58%) of the participants accessed the treatment material from home (see Table 1).

Beliefs Survey

The participants in Group 2, streaming video clips available, were asked to complete a short beliefs survey as part of the instrument (Appendix). For each belief statement, four responses were possible: strongly disagree (SD), disagree (D), agree (A), and strongly agree (SA). Out of the 38 members of Group 2, 71% (N=27) completed the beliefs survey (see Table 2). Significant Chi-Square relationships and frequencies are reported in Table 3.

Interview Results

Four random participants, two from each treatment group, were interviewed to determine if there are characteristics of streaming video in a Web-based instructional environment that lead to beliefs about the use and perceived effectiveness of streaming video in a Web-based instructional environment. The interview transcripts were analyzed, and certain categories of answers and themes emerged.

The first two subjects interviewed were members of the text and still-image only group. The subjects were identified as Subject 1, an 18-22 year old male enrolled in the College of Fine Arts with intermediate Web experience and who accessed the treatment from home, and Subject 2, an 18-22 year old female with a novice level of Web experience who is undecided about her major, and who accessed the treatment from a campus computer lab. The next two subjects were interviewed from the streaming video treatment group, identified as Subject 3, an 18-22 year old male enrolled in the College of Fine Arts who accessed the treatment materials from home and described himself as having expert Web experience and Subject 4, an 18-22 year old female enrolled in the College of Arts & Sciences who described herself as having intermediate Web experience and who also accessed the treatment materials from home. A number of interesting themes emerged from the questions concerning the streaming video clips, asked only of these two subjects.

First, a theme of the streaming video clips acting as a learning reinforcement ran through many of the answers given by both subjects. Subject 3 noted that he watched clips only when he needed clarification of a topic in the text of the tutorial. Subject 4 noted that she liked the reinforcement the clips offered the most. She stated that hearing the host talk and explain concepts from the accompanying text was a great method of reinforcement for her. Subject 4 went so far as to identify herself as "visually stimulated" and further stated that she would read the text first, and then watch the clips to know if she had interpreted the text correctly. Both subjects also felt the clips were easy watch and provided an avenue for immediate review of the content and learning.

A related theme found in the interview statements is the belief that the streaming video clips helped to hold the attention of the subjects. Subject 4 stated the clips helped maintain her

attention on the subject matter of the tutorial. Subject 3 noted that the clips added an element of motion to the tutorial, which helped to hold his attention, and to make the tutorial seem more interactive.

The third theme that emerged from the interviews relates to the attributes of the streaming video clips. Both subjects stated that the screen size of the streaming video clips did not affect the way they felt about the clips.

The next sets of questions were common to all four interview subjects and dealt with Web-based instruction as a whole. All four subjects felt that they were able to learn from the Web-based tutorial. Subjects 1 and 2, who did not view the streaming video clips, were not as positive about the amount of learning they experienced, as were the subjects who were able to view the streaming video clips. Subject 3 remarked that Web-based instruction is "like having a one-on-one experience with the instructor" while discussing his experiences with the tutorial.

Results of Pearson's R Correlation Between Demographics and Beliefs

The results of the beliefs survey and the demographics of Group 2, able to watch streaming video clips, were correlated using Pearson's R correlation coefficient. Three significant correlations were found, relating to understanding, item 7, and attention holding, item 8 (see Table 4). A significant moderate negative correlation was found ($r(25) = -.495, p = .009$) between the age of the subject and item 7, with younger subjects tending to agree and older subjects to disagree with item 7. Another significant moderate negative correlation ($r(25) = -.673, p = .000$) was found between undergraduate/graduate status and item 8, with graduate students tending to disagree, while undergraduates tended to agree. The Web experience level of the subject and item 8 also revealed a significant moderate positive correlation ($r(25) = .437, p = .023$). More experienced Web users tended to agree with item 8.

Discussion

Achievement gains are one measure of effectiveness. The use and perceived effectiveness of streaming video in Web-based instruction as measured by beliefs are another. Assessing the effectiveness of streaming video in Web-based instruction is important because if the use of streaming video in Web-based instruction grows as rapidly as the Internet seems to be growing, then at some point its instructional effectiveness will be called into question. Madachy and Miller (1978) noted that the integration of videotapes and computer-aided instruction had distinct advantages over the use of either medium by itself. Extending this statement to the new technology of streaming video, this study examined the use and perceived effectiveness of streaming video when it is integrated with Web-based instruction, which may be thought of as a form of computer-aided instruction. If demographic characteristics do play a role in beliefs about the perceived effectiveness of streaming video, then instruction using streaming video could be targeted more effectively.

A majority (58%) of the participants accessed the treatment material from home (see Table 1). This is advantageous given the low-speed dial up connection most Internet users have at home. While high-speed broadband access is available in many areas, only 14% of the Internet users in North America currently have high-speed Internet connections (Broadband: Europe Remains Behind in Broadband Game, 2001). Although the small sample size limits the generalizability of the study, the results from this exploratory study can still provide insight into the effectiveness of streaming video in Web-based instruction.

Gender was not found to lead to significantly different beliefs about the use and perceived effectiveness of streaming video in Web-based instruction. Interestingly, the age range of the participant was found to lead to significantly different beliefs on four of the belief items

dealing with understanding and learning from the streaming video clips, with younger participants more likely to agree or strongly agree with the statements (see Table 5). This supports findings by Chun and Plass (1994) who noted that QuickTime video clips were found to be more helpful in a language learning study than text alone. One possibility for this relationship between age and beliefs about streaming video may be due to learning style preferences. Stokes (2001) found that students who preferred visual learning had a significantly lower mean age than students who preferred verbal learning. Stokes described visual learners as preferring charts, diagrams, and pictures, while verbal learners prefer to listen or to read. Streaming video clips allow a user to see moving and still images, which would seem to favor visual learners over verbal learners.

Academic college as well as participants' status as either undergraduate or graduate was found to lead to a significantly different belief about the attention-holding ability of streaming video clips (see Table 5). No data were collected that might explain this difference between academic colleges. The overwhelming majority of undergraduate students tended to agree that streaming video clips helped hold their attention, while all of the graduate students disagreed that the clips helped hold their attention. One possibility for this may be that graduate students tend to be older and, at the University of Montevallo, enrolled in the College of Education. Age led to significantly different beliefs on visual-oriented belief statements in this study, and participants enrolled in the College of Education have been shown to disagree that streaming video clips helped hold their attention. A 1996 study by Wise and Groom also found that various forms of video programs held the interest of most secondary students better than instructor lecture alone. While secondary students are not equivalent to undergraduate students, the finding that video programs held interest better than lecture alone may have implications for the use of streaming

video as an enhancement to instruction with younger students. Although instruction should not focus exclusively on holding the attention of the student, a condition where the presentation becomes more important than the content, being able to hold the student's attention is a useful feature.

Students who accessed the clips from a campus computer lab were able to view the clips over a dedicated high-speed Internet connection, and they all agreed or strongly agreed that they learned more with the clips than without them. Students who accessed the clips from home, however, were almost as likely to disagree as to agree that they learned more with the streaming video clips available (see Table 5). Although no data were gathered about the type of computer and Internet connection participants had at their home, this points out the uncontrolled nature of home access for use in Web-based instruction. The nature of the Internet access therefore needs to be taken into account when using streaming video in Web-based instruction.

Four random participants were interviewed to determine if there are characteristics of streaming video that lead to beliefs about the use and perceived effectiveness of streaming video in a Web-based instructional environment. All four subjects felt that they were able to learn from the Web-based tutorial. Subjects 1 and 2, who did not view the streaming video clips, were not as positive about the amount of learning they experienced, as were the subjects who were able to view the streaming video clips.

The idea that the use of streaming video clips acts as a learning reinforcement when used as an augmentation to a text-based tutorial emerged from both subjects interviewed from the streaming video treatment group. Along with the idea of reinforcement, the subjects also stated that the streaming video clips enhanced the tutorial and were useful in learning, which also emerged from the results of the beliefs survey. Smith and Ransbottom (2000) found that video

can complement text and both subjects stated that they preferred having streaming video clips as an enhancement to a text and static image Web-based tutorial rather than viewing an entire course or tutorial by streaming video. This theme of the streaming video clips acting as a learning reinforcement supports the results of the Chi-Square comparisons of demographic characteristics with beliefs statements (see Table 5).

A related theme found in the interview statements is the belief that the streaming video clips helped to hold the attention of the subjects. This particular theme is also reflected in the Chi-Square comparisons that showed undergraduate students in the College of Arts & Sciences and the College of Fine Arts believed the clips helped to hold their attention. One subject stated that the streaming video clips added an element of motion and interactivity, which may be a source of the attention-holding ability of streaming video clips. As Hart, Hart, and Benavides (1992) noted, distance learning lectures must be dynamic and interactive. Further, Wise and Groom (1996) found that videos helped hold attention. One use for streaming video clips in Web-based instruction then, may be as a tool to hold the attention or stimulate the interest of the student.

The third theme that emerged from the interviews relates to the attributes of the streaming video clips. The streaming video clips as used in the study were designed to display at 160 pixels by 120 pixels resolution, which is considered to be one quarter of a normal screen size. The interview subjects all had positive feelings towards the clips, and the results of the beliefs survey show the subjects were also positively disposed towards the clips. This supports D. J. Dwyer's (1985) conclusions that screen size and resolution had no practical impact on a PC board chip locator task. Apparently, the ability of the human eye to discern detail (Strachan, 1996) is robust enough to make use of streaming video clips, at least for this study's sample. Additionally, a

previous study found that the fidelity of the audio is the most critical component of media with regard to getting the message across (Reeves & Nass, as cited in King, Harnar, & Mayall, 1999). The fidelity of the audio coupled with the ability of the human eye to discern detail may lead to the belief that streaming video is useful and effective. The positive beliefs found towards the usefulness of the streaming video clips support the production method used to create the clips. While this one study is not definitive and does not address best practices for streaming video clip creation, it is encouraging that traditional television production techniques may be applied to streaming video.

Unexpectedly, the interview subjects noted that the streaming video clips generated a feeling of the instructor's presence. Perhaps streaming video clips used in conjunction with Web-based instruction encourages these feelings of the social presence of the instructor. If this is so, streaming video clips may prove to be very useful in enhancing student satisfaction with Web-based instruction. This is reflected in a 1997 study by Boverie, Murrell, Lowe, Zittle, Zittle, and Gunawardena, who found a correlation between satisfaction and the social presence of the instructor.

Although learning style preferences were not a part of this study, two of the subjects believed the streaming video clips suited their learning style. The two subjects described themselves as visually oriented learners, and it may be that streaming video clips are better suited for one style of learner than another, or may be beneficial in general. Further study is warranted on this topic.

Pearson's r correlations were calculated between the demographic characteristics of participants in Group 2, the streaming video group, and the beliefs statements. A significant moderate negative correlation was found ($r(25) = -.495$, $p = .009$) for subject's age that

suggested younger participants tended to believe that the streaming video clips helped them to understand the material, with older participants disagreeing. Academic status revealed a significant moderate negative correlation ($r(25) = -.673, p = .000$), with undergraduate students agreeing that the clips helped hold their attention, while graduate students disagreed with that statement. A significant moderate positive correlation ($r(25) = .437, p = .023$) was found between an increase in subject's Web experience level and the belief that streaming video clips helped hold the subject's attention. The beliefs concerning attention holding and learning from the streaming video clips are supported by Ellis and Childs' (1999) study that found videos viewed within a Web page useful for learning.

Recommendations

This was an exploratory study designed to examine the effectiveness of streaming video in Web-based instruction. While streaming video was perceived to be effective by the subjects, a number of questions remain regarding the application of streaming video in Web-based instruction.

Streaming video suiting a visual learning style was a theme that emerged from the study. It is recommended that investigators explore the interaction of streaming video clips with learning style preferences. Will one or more learning styles benefit from streaming video in Web-based instruction more than others? The Web would seem to offer some advantages for different learning styles, since it allows multiple content delivery modes such as text, audio, and video to act as reinforcements to one another if the student needs it. It is also recommended that further studies explore the interaction of age and learning style preferences with the perceived or actual effectiveness of streaming video. Since age of the participant was previously shown to lead to significantly different beliefs about the effectiveness of streaming video, and because a

learning style preference theme arose from the interview analysis, further studies could determine if age and learning style interact to impact the effectiveness of streaming video in Web-based instruction.

One subject noted that he would prefer streaming video enhanced Web-based instruction over a book because he felt the streaming video added an element of interactivity. Further study regarding the interactivity of streaming video is warranted. Streaming video technologies allow for "hotspots" to be placed in the video window that the user can click on to trigger a Web browser events as well as self-timed events to occur (RealNetworks, n.d.). Other technologies such as SMIL and Macromedia's Flash allow the creation of streaming video lectures that closely resemble a Microsoft PowerPoint presentation (Spotlight on multimedia, n.d.). It is recommended that future studies examine these technologies to determine if they are superior to streaming plain video. Another question that may be explored is if there is a way to take advantage of this technology to better serve the student, or to better serve various learning styles? Future studies may find that streaming video is an excellent way to promote interactive learning as described by Tapscott (as cited in Stokes, 2001).

Technical issues raise a number of questions and recommendations for further research such as studying the effect of bandwidth on the effectiveness of streaming video clips. Until all Internet connections are high-speed, bandwidth will be an issue for the use of streaming video in Web-based instruction. Bandwidth concerns impact issues such as video window size, amount of compression, and the rationing of bandwidth between audio, video motion, and video detail. It is recommended that future studies explore these topics to determine best practices for the delivery of streaming video clips.

Due to the limited sample size of this study, it is recommended that further study be given to the relationship between age and perceived effectiveness of streaming video. It is also recommended that this study be replicated, and that future studies compare streaming video-only tutorials with streaming video clips used as an augmentation to a text-based tutorial.

While the results of this study suggest that streaming video is perceived as effective in Web-based instruction, many questions about this new technology remain. Streaming video will probably not be the one technology that rewrites the future of instruction, but it may prove to be a very useful tool. If for no other reason than students perceive it to be useful as the subjects in this study did, then institutions and instructors should not be afraid of implementing some form of streaming video.

References

Anderson, C. (1982, March). Digital Video. How it works, what it can do, and when it's coming. Instructional Innovator, 27(3), 22-27.

Belanger, F., and Jordan, D. H. (2000). Evaluation and implementation of distance learning: Technologies, tools and techniques. Hershey, PA: Idea Group Publishing.

Boverie, P., Murrell, W. G., Lowe, C. A., Zittle, R. H., Zittle, F., and Gunawardena, C. N., (1997). Live vs. taped: New perspectives in satellite-based programming for primary grades. Available from The University of New Mexico College of Education Organizational Learning and Instructional Technologies. Albuquerque, N. M. (ERIC Document Reproduction Service No. ED407939)

Broadband: Europe Remains Behind in Broadband Game. (2001, June). http://cyberatlas.internet.com/markets/broadband/article/0,,10099_783401,00.html#table. First accessed 7-13-01.

Brown, L. A. (1975, August). Learner responses to the use of television in UMA courses. Executive summary No. 8. Office of Public Affairs and Information Services, University of Mid-America, Lincoln, Nebraska. (ERIC Document Reproduction Service No. ED159969)

Chao, M. (1999). The impact of a systems approach on interactive distance teaching: The development of the ATM video network system at National Chung Cheng University. Educational Technology Research and Development 47 (2), 112-117.

Chun, D. M. and Plass, J. L. (1994). Assessing the effectiveness of multimedia in language learning software. Educational Multimedia and Hypermedia, 1994. Proceedings of ED-MEDIA 94. World conference on educational multimedia and hypermedia. Vancouver, British Columbia, Canada. (ERIC Document Reproduction Service No. ED388233)

Cofield, J. (2001). The Effectiveness of Streaming Video in Web-based Instruction. Unpublished Doctoral Dissertation, University of Alabama, Tuscaloosa.

DiPaolo, A. (1999 December). Stanford Learning: Worldwide Availability On-Demand at Stanford Online. T. H. E. Journal, 27(5), 16.

Dixon, D. (2000, May). Streaming Video DOWN From The Web. Camcorder & Computer Video, 16 i5, 24.

Dwyer, D. J. (1985, May). An exploratory study of the effect of screen size and resolution on the legibility of graphics in automated job performance aids. Final report. Air Force Human Resources Lab, Brooks AFB, Texas; Naval Training Equipment Center, Orlando, Florida, (Report No. AFHRL-TR-84-55; NAVTRAEQUIPCEN-IH-355). (ERIC Document Reproduction Service No. ED 260690)

Edwards, C. and Fritz, J. H. (1997, April). Evaluation of Three Educational Online Delivery Approaches. From Mid-South Instructional Technology Conference Proceedings, (2nd, Murfreesboro, Tennessee, April 6-8, 1997). Available: http://www.mtsu.edu/~itconf/proceed/97/online_3.html.

Ellis, R. and Childs, M. (1999, October). The effectiveness of video as a learning tool in on-line multimedia modules. Journal of Educational Media, 24(3), 217-224.

Fact Book 1999 – 2000. (n.d.). http://www.montevallo.edu/irpa/FactBooks/Factbook 1999.PDF. First accessed 7-2-01.

Gall, M. D., Borg, W. R., & Gall, J. P. (1996). Educational research: An introduction (6th ed.). USA: Longman.

Hart, R. A., Hart, P. B., Benavides, O. E. (1992, February). Establishing rural ITFS distance education programs: The California State University, Fresno Experience. Paper presented at the Association for Educational Communication and Technology Conference, Washington, D.C. (ERIC Document Reproduction Service No. ED346846)

Heath, A. W. (1997, March). The proposal in qualitative research. The Qualitative Report 3(1). http://www.nova.edu/ssss/QR/QR3-1/heath.html. First accessed 7-18-01.

Hecht, J.B., and Klass, P. H. (1999, April). The evolution of qualitative and quantitative research classes when delivered via distance education. Paper Presented at the Annual Meeting of the American Educational Research Association, Montreal, Ontario, Canada, April 19-23, 1999. (ERIC Document Reproduction Service No. ED430480)

Hecht, J. B., and Schoon, P. L. (1999, April). Using CU-SeeMe to deliver a masters-level course over the Internet. Paper presented at the Annual Meeting of the American Educational Research Association. Montreal, Ontario, Canada. (ERIC Document Reproduction Service No. ED430481)

Johnson, N. (1998, December). Web Video in the Real World. DV, 6(12), 24-33.

Jung, I. And Rha, I. (2000). Effectiveness and cost-effectiveness of online education: A review of the literature. Educational Technology, July-August 2000, 57-60.

King, F. B., Harnar, M. A., & Mayall, H. J. (1999, April). Implications of using asynchronous video in distance learning. Paper presented at the Annual Meeting of the American Educational Research Association, Montreal, Quebec, Canada. (ERIC Document Reproduction Service No. ED429591)

Liegle, J. O., and Meso, P. N. (2000). Web-based instruction systems. In L. K. Lau (Ed.). Distance learning technologies: Issues, trends and opportunities (pp. 186-207). Hershey, PA: Idea Group Publishing

Madachy, J. L., and Miller, J. D. (1978). The role of CAI and video tapes as instructional supplements to an English language program for the hearing impaired. U.S. Department of Health, Education, & Welfare National Institute of Education. (ERIC Document Reproduction Service No. ED160085)

Mahendran, M., and Young, J. (1998, September). Use of advanced technology videotapes in the delivery of structural engineering courses. Journal of Engineering Education, 23(3), 327-338.

Marsh, G. E. (n.d.). http://www.bamaed.ua.edu/bct100/100top4.htm. First accessed 5-11-01.

Merriam-Webster Online. (2000). http://www.m-w.com. First accessed 11-20-00.

Miller, J. W., McKenna, M. C., & Ramsey, P. (1993, June). An evaluation of student content learning and affective perceptions of a two-way interactive video learning experience. Educational Technology, 33, 51-55.

Ohanion, T. A. (1998). Digital nonlinear editing: Editing film and video on the desktop (2nd Ed.). Boston: Focal Press.

Pescatore, M. J. (2000, July). Media streaming makes progress. Videography, 25(7), i4-i9.

Real Video. (n.d.). http://www.web-ads.com/cbertech/realvid1.html. First accessed 11-3-00.

RealNetworks. (n.d.). http://www.realnetworks.com. First accessed 9-11-00.

RealNetworks reports first quarter results. (2001, April 17). http://www.realnetworks.com/company/pressroom/pr/2001/q101results.html. First accessed 5-11-01.

Rule, J. (1999, June 4). RealVideo: Waiting for bandwidth. http://webreview.com/pub/1999/06/04/stream/index.html. First accessed 11-1-00.

Schultz, C.S. and Rouan, M. (1998, January). Stanford online: The Stanford University experience with online education. Distance Learning '98. Proceedings of the Annual Conference on Distance Teaching and Learning. 14th, Madison, Wisconsin, August 5-7, 1998.

Smith, T. L., and Ransbottom, S. (2000). Digital video in education. In L. K. Lau (Ed.), Distance Learning Technologies: Issues, Trends and Opportunities (pp. 125- 142). Hershey, PA: Idea Group Publishing.

Spotlight on multimedia. (n.d.). http://cnet.com/webbuilding/pages/Graphics/MMSpotlight/. First accessed 7-15-01.

Strachan, D. (1996, February). Video compression. Society of Motion Picture and Television Engineers Journal,

Stokes, S. (2001). Temperament, learning styles, and demographic predictors of college student satisfaction in a digital learning environment. Unpublished Doctoral Dissertation, University of Alabama, Tuscaloosa.

Verhagen, P. (1994). Functions and design of video components in multi-media applications: A review. In J. Schoenmaker & I. Stanchev (Eds.), Principles and tools for instructional visualization (pp. 61-88). University of Twente, The Netherlands: Faculty of Educational Science and Technology. (ERIC Document Reproduction Service No. ED 367305)

Waggoner, B. (1998, September). Streaming Media: RealSystem, Netshow, and Quicktime. How do they stack up? Interactivity, 4(9), 23-29.

Waggoner, B. (2000). Choosing a Streaming Video Technology. http://www.dv.com/webvideo/2000/0500/waggoner0500.html. First accessed 9-2-00.

Weill Medical College of Cornell University Grand Rounds Project. (n.d.). http://www.odl.cornell.edu/pr/cumc/default.htm. First accessed 11-13-00.

Williams, J. (2000, February). Sites go straight to video. Editor & Publisher, 133(6), I33-I37.

Wise M., and Groom, F. M. (1996). The effects of enriching classroom learning with the systematic employment of multimedia. Education, 117(1), 61-70.

Zettl, H. (2001). Video Basics 3. Belmont: Wadsworth.

Table 1

Gender, Age, Academic College, Undergraduate/Graduate Status, Access Location, and Web Experience

Variable	Number	Percentage
Gender		
Male	23	37.7
Female	43	62.3
Age		
18-22	49	71.0
23-28	7	10.1
29-39	5	7.2
40-49	4	5.8
50+	4	5.8
Academic College		
Arts & Sciences	23	33.3
Business	15	21.7
Education	16	23.2
Fine Arts	12	17.4
Undecided	3	4.3
Undergraduate/Graduate Status		
Undergraduate	59	84.3
Graduate	11	15.7
Internet Access Location Used for Study		
Home	40	58.0
Campus Computer Lab	29	42.0
Prior Experience Level With the Web		
Minimal	17	24.6
Novice	23	33.3
Intermediate	26	37.7
Expert	3	4.3

Table 2

Beliefs Survey Frequencies, Percentages, Measures of Central Tendency and Variation

Item	Mean	Std. Dev.	Strongly Disagree		Disagree		Agree		Strongly Agree	
			n	%	n	%	n	%	n	%
Q1	3.11	.51			2	7.4	20	74.1	5	18.5
Q2	3.00	.48			3	11.1	21	77.8	3	11.1
Q3	2.52	.64	1	3.7	12	44.4	13	48.1	1	3.7
Q4	2.89	.70	1	3.7	5	18.5	17	63.0	4	14.8
Q5	2.78	.70	1	3.7	7	25.9	16	59.3	3	11.1
Q6	2.81	.62			8	29.6	16	59.3	3	11.1
Q7	3.00	.48			3	11.1	21	77.8	3	11.1
Q8	2.85	.46			5	18.5	21	77.8	1	3.7
Q9	2.89	.42			4	14.8	22	81.5	1	3.7
Q10	2.81	.40			5	18.5	22	81.5		
Q11	3.07	.47			2	7.4	21	77.8	4	14.8
Q12	3.04	.59			4	14.8	18	66.7	5	18.5

Table 3

Crosstabs Comparison, Group 2 Demographics and Streaming Video Beliefs

Variable		Beliefs Item 1: The streaming video clips are easy to understand. SD	D	A	SA	Total	X^2
Age	18-22		1	17	3	21	
	23-28			2	2	4	
	40-49		1			1	
	50+			1		1	
	Total		2	20	5	27	.013*
		Beliefs Item 2: … adding streaming video clips to Web pages makes the Web pages better. SD	D	A	SA	Total	X^2
Age	18-22		2	17	2	21	
	23-28			4		4	
	40-49		1			1	
	50+				1	1	
	Total		3	21	3	27	.008**
		Beliefs Item 7: The streaming video clips helped me understand the material. SD	D	A	SA	Total	X^2
Age	18-22		1	18	2	21	
	23-28			3	1	4	
	40-49		1			1	
	50+		1			1	
	Total		3	21	3	27	.006**
		Beliefs Item 11: I think streaming video clips are helpful in learning. SD	D	A	SA	Total	X^2
Age	18-22		1	17	3	21	
	23-28			3	1	4	
	40-49		1			1	
	50+			1		1	
	Total		3	21	3	27	.034*

table continues

Table 3 Continued

Beliefs Item 8: The streaming video clips helped hold my attention.					
	SD	D	A	SA	Total	X^2
College						
Arts & Sciences			12		12	
Business		1	4		5	
Education		3			3	
Fine Arts			5	1	6	
Undecided		1			1	
Total		5	21	3	27	.002**

Beliefs Item 8: The streaming video clips helped hold my attention.					
	SD	D	A	SA	Total	X^2
Undergraduate/ Graduate Status						
Undergraduate		2	21	1	24	
Graduate		3			3	
Total		5	21	1	27	.001**

Beliefs Item 6: I learned more with the streaming video clips than I would have without them.					
	SD	D	A	SA	Total	X^2
Access Location						
Home		8	7	2	17	
Campus Computer Lab			9	1	10	
Total		8	16	3	27	.027*

Note. *p < .05. **p < .01

Table 4

Pearson's R Correlations Group 2 Demographics with Streaming Video Beliefs

Correlation		SD	D	A	SA	Total	r	Sig.
Beliefs Item 7: The streaming video clips helped me understand the material.								
Group 2 Age	18-22		1	18	2	21		
	23-38			3	1	4		
	40-49		1			1		
	50+		1			1		
	Total		3	21	3	27	-.495	.009**
Beliefs Item 8: The streaming video clips helped hold my attention.								
Group 2 Undergraduate/ Graduate Status								
	Undergraduate		2	21	1	24		
	Graduate		3			3		
	Total		5	21	1	27	-.673	.000***
Beliefs Item 8: The streaming video clips helped hold my attention.								
Group 2 Web Experience								
	Minimal		2	1		3		
	Novice		2	6		8		
	Intermediate		1	11	1	13		
	Expert			3		3		
	Total		5	21	1	27	.437	.023*

Note. *p < .05. **p < .01. ***p < .001

Table 5

Demographic Characteristics with Significant Chi-Square Differences on Belief Items

Demographic	Belief Statement	X^2
Age Range	The streaming video clips are easy to understand.	.013*
Age Range	I think adding streaming video clips to Web pages makes the Web pages better.	.008**
Age Range	The streaming video clips helped me understand the material.	.006**
Age Range	I think streaming video clips are helpful in learning.	.034*
College	The streaming video clips helped hold my attention	.002**
Undergraduate/ Graduate Status	The streaming video clips helped hold my attention	.001**
Access Location	I learned more with the streaming video clips than I would have without them	.027*

Note. *p < .05. **p < .01

Appendix

Streaming Video Beliefs Survey

Streaming Video Beliefs Survey

[This is a Web-based form]

Please type in your group number [ ] (required)
If you have started over, please enter an "X"

We would like to find out more about what you thought of the video examples. Please answer all questions honestly.

For each of the following 12 survey items, please click on the button that best describes you, or your belief about the item.

Strongly Disagree = SD	Disagree = D	Agree = A	Strongly Agree = SA

1. The streaming video clips are easy to understand.

SD ○ D ○ A ○ SA ○

2. I think adding streaming video clips to Web pages makes the Web pages better.

SD ○ D ○ A ○ SA ○

3. I can learn as much from text illustrated with still pictures as I can from watching streaming video clips.

SD ○ D ○ A ○ SA ○

4. I experienced no problems with the streaming video clips.

SD ○ D ○ A ○ SA ○

5. I can learn as much from streaming video clips as I could from watching television.

SD ○ D ○ A ○ SA ○

6. I learned more with the streaming video clips than I would have without them.

SD ○ D ○ A ○ SA ○

7. The streaming video clips helped me understand the material.

SD jn D jn A jn SA jn

8. The streaming video clips helped hold my attention.

SD jn D jn A jn SA jn

9. The streaming video clips are easy to watch.

SD jn D jn A jn SA jn

10. I enjoy watching streaming video on my computer.

SD jn D jn A jn SA jn

11. I think streaming video clips are helpful in learning.

SD jn D jn A jn SA jn

12. I can learn as much from watching streaming video clips as I could from reading text in a book or on a computer screen.

SD jn D jn A jn SA jn

When finished answering all of the survey questions, please click on the "submit" button.

[*Submit & Go To The Quiz!* Button]

PLEASE PRESS ONLY ONCE
(unless you have started over)

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